DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1-11, 14-24, 26-30, 32-39, 41-48, 57-60, 62, and 63, in the reply filed on August 4, 2009 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). In applicant's written response to the examiner's election/restriction requirement, the attorney did not elect a species from Group 1. In a subsequent phone conversation with Thomas Schneck on August 18, 2009, applicant elected Method Species 1, claims 1-11 without traverse.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. Authorization for this examiner's amendment was given in a telephone interview with Thomas Schneck on October 19, 2009.

4. Cancel claims 2, 3, and 12-63.

5. Replace claim 1 with the following:

A method for removal of one of more particles on a surface, the method comprising:

providing an assembly of ~~l activatable transducers , with l ≥ 2,~~ two or more activatable transducers, with each transducer being capable of generating at least one cavity in a selected particle removal liquid, where the generated cavity subsequently collapses and provides a mechanism for removal of at least one particle on a surface suspended in the particle removal liquid;

electrically connecting said transducer assembly to a servo control unit;

immersing the transducer assembly in a selected test liquid;

activating at least one transducer of said transducer assembly;

measuring cavity density produced by the at least one transducer;

determining whether to adjust at least one parameter of the at least one transducer;

using said servo control unit to adjust the at least one parameter if adjustment occurs;

removing the transducer assembly from the test liquid ~~and immersing the transducer assembly in the particle removal liquid~~, disconnecting the transducer assembly from the servo control unit, and immersing the transducer assembly in the particle removal liquid after the servo control unit is disconnected; and

activating the at least one transducer in the particle removal liquid, and allowing at least one cavity produced by at least one of the transducers to collapse and to thereby remove at least one particle on a surface immersed in the particle removal liquid.

6. In claim 8, after the words “allowing at least one additional cavity produced by said at least" insert ---one---.

7. Replace claim 9 with the following:

A method for removal of one or more particles on a surface, the method comprising:

providing an assembly of two or more activatable transducers, with each transducer being capable of generating at least one cavity in a selected particle removal liquid, where the generated cavity subsequently collapses and provides a mechanism for removal of at least one particle on a surface suspended in the particle removal liquid;

electrically connecting said transducer assembly to a servo control unit;

immersing the transducer assembly in a selected test liquid;

activating a first transducer in the assembly to produce at least one cavity in the test liquid, estimating a first representative cavitation density $\rho_{cav}(1)$ produced by the first transducer and computing a first difference, $|\rho_{cav}(1) - \rho_{cav}(ref)|$, where $\rho_{cav}(ref)$ is a selected reference cavitation density,

when the magnitude of the first difference is greater than a selected difference threshold $\Delta\rho_{thr}$, adjusting at least one parameter on the first transducer with the servo control unit so that at least one of the following conditions is satisfied: (i) the magnitude of the first difference is reduced to no greater than the difference threshold and (ii) the magnitude of the first difference is minimized;

activating a second transducer in the assembly to produce at least one cavity in the test liquid, estimating a second representative cavitation density $\rho_{cav}(2)$ produced by the second transducer, and computing a second difference, $|\rho_{cav}(2) - \rho_{cav}(ref)|$;

when the magnitude of the second difference is greater than $\Delta\rho_{thr}$, adjusting at least one parameter on the second transducer with the servo control unit so that at least one of the following conditions is satisfied: (i) the magnitude of the second difference is reduced to no greater than the difference threshold and (ii) the magnitude of the second difference is minimized;

removing the transducer assembly from the test liquid ~~and immersing the transducer assembly in the particle removal liquid~~, disconnecting the transducer assembly from the servo control unit, and immersing the transducer assembly in the particle removal liquid after the servo control unit is disconnected; and

activating at least the first and second transducers in the particle removal liquid, and allowing at least one cavity produced by at least one of the first and second transducers to collapse and to thereby remove at least one particle on the surface immersed in the particle removal liquid.

8. Replace claim 10 with the following:

A method for removal of one or more particles on a surface, the method comprising:

providing an assembly of [[I]]N activatable transducers, with [[I]]N ≥ 2, with each transducer being capable of generating at least one cavity in a selected particle removal liquid, where the generated cavity subsequently collapses and provides a mechanism for removal of at least one particle on a surface suspended in the particle removal liquid;

electrically connecting said transducer assembly to a servo control unit;

immersing the transducer assembly in a selected test liquid;

activating each of a subset if [[l']]N' transducers in the assembly, numbered [[i']]n' = 1, …, [[i']]n', with 1 < [[I']]n' ≤ [[l]]N to produce at least one cavity in the test liquid for each activated transducer in the subset, estimating a representative cavitation density ρ_{cav}([[i']]n') produced by transducer number [[i']]n', and computing a density difference, $\Delta\rho$([[i']]n') = |ρ_{cav}([[i']]n') - ρ_{cav}(ref)|, for each of [[i']]n' = 1, .[[,]].., [[l']]N', where ρ_{cav}(ref) is a selected reference cavitation density,

forming a statistical average D{$\Delta\rho$([[i]]n1), …, $\Delta\rho$([[l']]N')} of the [[l']]N' density differences;

when the statistical average D{$\Delta\rho$([[i]]n1), …, $\Delta\rho$([[l']]N')} is greater than a selected difference threshold $\Delta\rho_{thr}$, adjusting at least one parameter for at least one of the [[l']]N' transducers with the servo control unit so that at least one of the following conditions is satisfied: (i) the statistical average D{$\Delta\rho$([[i]]n1), …, $\Delta\rho$([[l']]N')} after the adjustment is reduced to a value no greater than the difference threshold and (ii) the magnitude of the statistical average D{$\Delta\rho$([[i]]n1), …, $\Delta\rho$([[l']]N')} is minimized;

removing the transducer assembly from the test liquid ~~and immersing the transducer assembly in the particle removal liquid~~, disconnecting the transducer assembly from the servo control unit, and immersing the transducer assembly in the particle removal liquid after the servo control unit is disconnected; and

activating at least the [[l']]N' transducers in the particle removal liquid, and allowing at least one cavity produced by at least one of the [[l']]N' transducers to collapse and to thereby remove at least one particle on the surface immersed in the particle removal liquid.

9. In claim 11, replace the variable I with the variable *N*, replace the variable i with the variable n, replace the variable i with the variable *n*, and replace the variable i' with the variable n'.

Reasons for Allowance

10. The following is an examiner's statement of reasons for allowance: the reviewed prior art does not teach or render obvious the processes described in independent claims 1, 9, and 10.

11. The most relevant prior art is U.S. Patent No. 6,016,821 to Puskas. Puskas teaches a method of performing ultrasonic cleaning of a semiconductor wafer that involves monitoring the cavitation density produced by the cavitation process and using a servo controller to optimize the cavity density while the cleaning process is being performed (Col. 1. 50-61; Col. 2, 24-30; Col. 17, line 29 to Col. 18, line 65). Puskas does not teach performing the cavity density optimization step in a test liquid and subsequently disconnecting the servo controller from the cavitation generator prior to using the cavitation generator to actually perform cleaning. The reviewed prior art does not provide motivation to modify the method of Puskas in order to perform one of the methods claimed by applicant in claims 1, 9, and 10.

12. Claims 4-8 depend on claim 1 and are allowable for at least the same reason that claim 1 is allowable, and since claim 11 depends on claim 10, it is allowable for at least the same reason that claim 10 is allowable.

13. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RYAN COLEMAN whose telephone number is (571)270-7376. The examiner can normally be reached on Monday-Friday, 9-5.

15. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on (571)272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RLC/
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October 22, 2009

/Michael Kornakov/

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